NOTICE!

ALL DRAWINGS
ARE LOCATED
AT THE END OF
THE DOCUMENT

RF/ER-96-0041

Sampling And Analysis Plan for the Pre-Remediation Investigation of the Mound, 903 Pad and Trench T-1

JULY 25, 1996
Revision. 0

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ACRONYMS

BSL	Background screening level
BGS	Below Ground Surface
CDPHE	Colorado Department of Public Health and Environment
CLP	Contract Laboratory Program
COC	Chemical-of-Concern
COC	Chain of Custody
DCE	Dichloroethene
DOE	Department of Energy
DMP	Data Management Plan
DQO	Data Quality Objective
EPA	Environmental Protection Agency
EQS	Environmental Quality Support
ER	Environmental Restoration a k a ERM, Environmental Restoration Management
FID	Flame-ionization Detector
GC	Gas Chromatography
GRRASP	General Radiochemistry and Routine Analytical Service Protocol
IHSS	Individual Hazardous Substance Site
OU	Operable Unit
PAM	Proposed Action Memorandum
PCE	Tetrachloroethylene
PID	Photoionization Detector
PPRG	Programmatic Preliminary Risk -Based Remediation Goal
QAA	Quality Assurance Addendum
QAPjP	Quality Assurance Project Plan
QA/QC	Quality Assurance/Quality Control
RFETS	Rocky Flats Environmental Technology Site
RFEDS	Rocky Flats Environmental Database System
SAP	Sampling and Analysis Plan
SQL	Sample quantitation limit
SVOCs	Semi-volatile organic compounds
TCE	Trichloroethylene
TCL-VOA	Target Compound List-Volatile Organic Analysis
USEPA	United States Environmental Protection Agency
VOCs	Volatile organic compounds
1,1-DCA	1,1-Dichloroethane
1,1-DCE	1,1-Dichloroethene
1,2-DCE	1,2-Dichloroethene
1,1,1-TCA	1,1,1-Trichloroethane

96-DMR-CRM-0241

1. INTRODUCTION

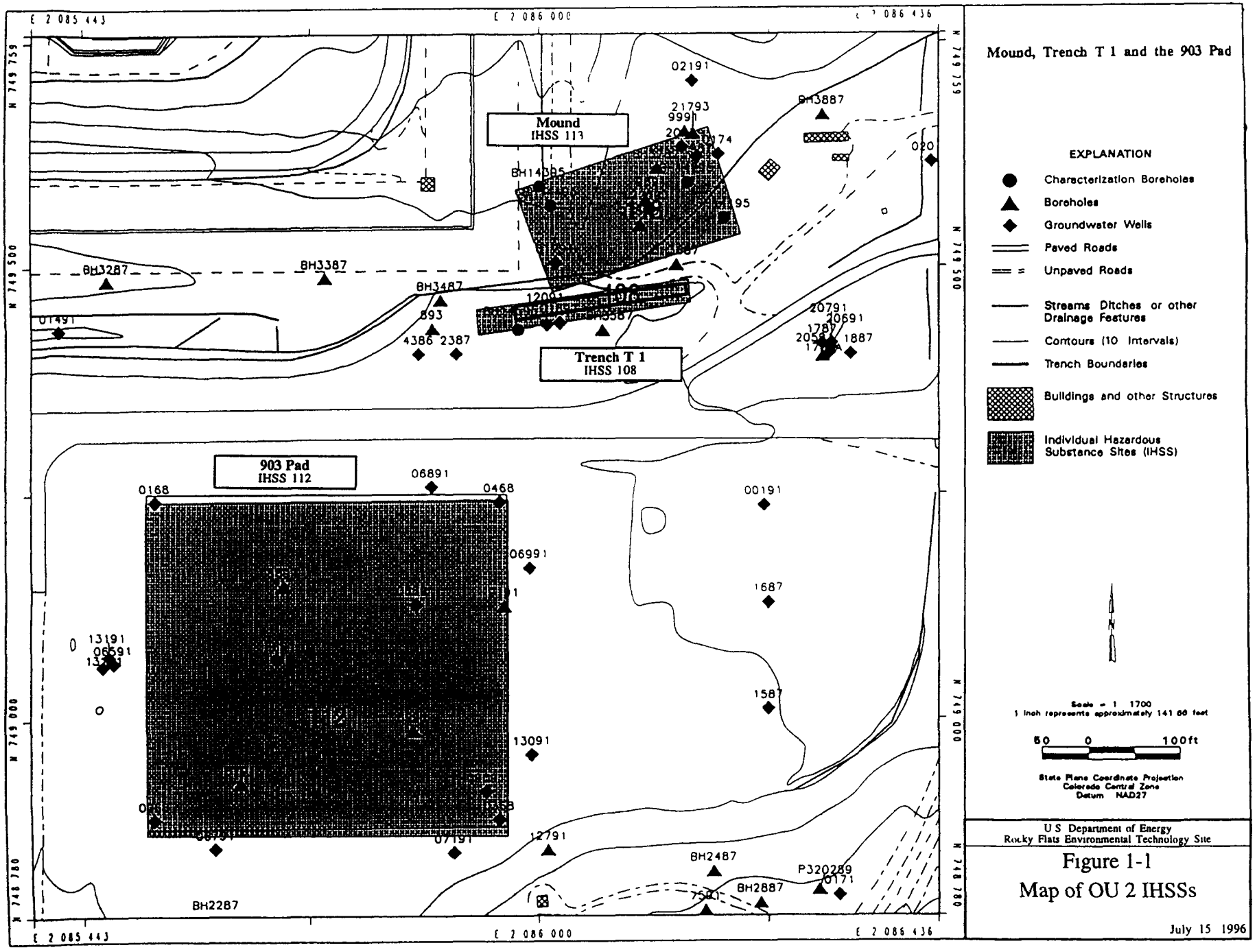
This Sampling and Analysis Plan (SAP) describes the steps necessary to collect data to characterize Trench T-1 (IHSS 108), and define the areal extent of the volatile organic compound (VOC) contamination at the Mound Site (IHSS 113), and the 903 Pad (IHSS 112) in support of early removal actions The objective of the SAP is to describe the specific data needs, sampling and analysis requirements, data handling procedures, and associated Quality Assurance/ Quality Control (QA/QC) requirements for the completion of soil gas and subsurface soil sampling The data gathered from these activities will be used to estimate volumes of soil requiring removal for treatment or disposal

1.1 Background

Trench T-1 (IHSS 108), is located southeast of the Protected Area fence and north of Central Avenue (Figure 1-1) The trench is roughly 150 feet long by 20 feet wide by 10 feet deep Approximately 125 drums containing depleted uranium chips, hydraulic oil, carbon tetrachloride (CCl_4), metal turnings, distillation bottoms, copper alloy, and cemented cyanide waste are believed to have been disposed in this trench from 1954 to 1962 (RF/ER-95-0010, DOE 1995a) Previous investigations included soil gas and geoprobe sampling of the area near the trench margins, ground penetrating radar (GPR), and electromagnetic surveys (EM-31 and EM-61) over the trench The electromagnetic survey results indicate metallic objects are buried within the trench (see Figure 3 2-1)

Due to concern about the suspected presence of pyrophoric uranium in some of the drums disposed of in Trench T-1, no intrusive activities have occurred within the trench boundaries Groundwater contamination is found in wells down gradient from the trench, however, these wells are subject to influence from other IHSSs and do not provide sufficient information to determine if Trench T-1 is the source Samples from within the trench are required to determine the nature of contaminants in the trench and whether these are a potential source of contamination to surface water through a groundwater pathway

The Mound Site is located north of Trench T-1 and east of the Protected Area fence (Figure 1-1) Between 1954 and 1958, drums containing hydraulic oil and carbon tetrachloride (CCl_4) contaminated with depleted uranium and beryllium were buried at this site Additionally, historical records show some of the buried drums contained tetrachloroethene (PCE),


Mound, Trench T 1 and the 903 Pad
Mound
IHSS 113
Trench T 1
IHSS 108
903 Pad
IHSS 112
EXPLANATION
Characterization Boreholes
Boreholes
Groundwater Wells
Paved Roads
Unpaved Roads
Streams Ditches or other Drainage Features
Contours (10 Intervals)
Trench Boundaries
Buildings and other Structures
Individual Hazardous Substance Sites (IHSS)
Scale = 1 1700
1 inch represents approximately 141 66 feet
50 0 100ft
State Plane Coordinate Projection
Colorado Central Zone
Datum NAD27
U S Department of Energy
Rocky Flats Environmental Technology Site
Figure 1-1
Map of OU 2 IHSSs
July 15 1996
E 2 085 443
E 2 086 000
E 2 086 436
N 749 759
N 749 500
N 749 000
N 748 780
BH3287
BH3387
BH3487
BH2287
BH2487
BH2887
BH3887
02191
21793
01491
06891
0168
0468
06991
13191
13091
12791
07191
00191
1687
1587
1887
P320289
0171

enriched uranium, and plutonium (DOE 1991, *Final Phase II RFI/RI Work Plan TM 1, RFP 903 Pad, Mound and East Trenches Areas,* DOE 1992, *Final Historical Release Report for the Rocky Flats Plant*)

In 1970, after it was discovered the integrity of the drums was failing and leakage was detected, all the drums and the associated radionuclide contaminated soils were removed from the Mound Site Later investigations have found levels of volatile organic compounds (VOCs) in groundwater samples down gradient from the site which exceed the Action Levels and Standards Framework for Subsurface Soils as established in Attachment 5 of the Draft Rocky Flats Cleanup Agreement (March 14, 1996) Initial characterization results indicate increasing concentrations of PCE and trichloroethene (TCE) to a depth of 20 feet and decreasing concentrations below that depth A more detailed account of contamination at this site is available in the *Phase II RFI/RI Report for Operable Unit No 2 903 Pad, Mound, and East Trenches Area* Additional sampling is required to identify the amount and extent of material which will require removal and or treatment

The 903 Pad (IHSS 112) is located south of Central Avenue at the western edge of the eastern buffer zone (Figure 1-1) The site was previously used for storage of drums containing cutting fluids contaminated with plutonium Leakage from the drums contaminated the area, most of which is presently sealed under an asphalt cap Previous investigations which included soil gas surveys, soil sampling, and groundwater monitoring have shown VOC constituents present within the IHSS include TCE, PCE and CCl_4 Additional sampling beneath the asphalt cap and the area surrounding the cap is necessary to adequately identify the area of VOC contamination exceeding the proposed RFETS Action Levels for subsurface soils Additional investigations, using a High Purity Germanium (HPGe) Radiation Survey, are anticipated to determine the extent of radiological contamination

1 2 Data Summary

Previous investigations within OU 2 have included soil gas sampling, surface and subsurface soil sampling, as well as groundwater monitoring Tables 1 2-1 through 1 2-3 show the maximum concentrations detected for the Chemicals-of-Concern (COC) within and near the Mound Site, Trench T-1, and the 903 Pad The COCs for OU 2 were agreed to by the Department of Energy (DOE), the Environmental Protection Agency (EPA), and the Colorado Department of Public Health and Environment (CDPHE) in Technical Memorandum No 9 Chemicals of Concern, Human Health Risk Assessment 903 Pad, Mound, and East Trenches Areas Operable Unit No 2, August 1994

TABLE 1.2-1 MAXIMUM CONCENTRATIONS OF CHEMICALS OF CONCERN DETECTS FOR GROUNDWATER AND SUBSURFACE SOILS NEAR IHSS 113 (MOUND SITE)

*LOCATION CODE	SAMPLE NUMBER	SAMPLE TYPE	DEPTH (Ft)	ANALYTE	RESULT	**LAB QUAL	SAMPLE DATE
174	1-74-07-23-87	GW		1,1-Dichloroethene	90 µg/l		23-Jul-87
14495	BH20855WC	BH	12 5 - 15 0	Carbon Tetrachloride	5 µg/kg	J	19-May-95
21593	BH20197WC	BH	24	Chloroform	66 µg/kg		10-May-93
174	1-74-05-22-87	GW		Chloroform	38 µg/l		22-May-87
14295	BH20840WC	BH	5 - 8	Methylene chloride	44,000 µg/kg	B	18-May-95
174	GW00639IT	GW		Methylene chloride	4,100 µg/l	B	15-Nov-90
14295	BH20840WC	BH	5 - 8	Tetrachloroethene (PCE)	800,000 µg/kg		18-May-95
174	1-74-05-22-87	GW		Tetrachloroethene	500,000 µg/l		22-May-87
174	1-74-05-22-87	GW		Trichloroethene	18,000 µg/l		22-May-87
14295	BH20857WC	BH	15 7 - 16	Trichloroethene	8,600 µg/kg	DJ	18-May-95
3787	BH378700005	BH	0 0 - 5 0	Arsenic	20 mg/kg		16-Jul-87
22393	GW02095GA	GW		Arsenic	8 3 µg/l	B	13-Feb-95
1791	GW02598IT	GW		Cadmium	4 8 µg/l	B	17-Mar-92
3787	BH378725BR	BH	25 0 - 26 2	Cadmium	3 3 mg/kg		17-Jul-87
1791	GW02173IT	GW		Mercury	0 27µg/l		19-Dec-91
21793	BH20321WC	BH	31 9 - 37 4	Mercury	0 15 mg/kg		3-Jun 93
22393	GW02407GA	GW		Nitrate	2,920 µg/l		16-May-95
3787	BH37870005	BH	0 0 5 0	Americium-241	0 48 pCi/g		16-Jul-87
174	1-74-07-23-87	GW		Americium-241	0 16 pCi/l		23 Jul-87
14295	BH20837WC	BH	0 0 3 5	Plutonium-239/240	0 0316 pCi/g		18-May-95
174	GW00639IT	GW		Plutonium-239/240	0 0027pCi/l		15 Nov-90
14295	BH20837WC	BH	0 0 - 3 5	Uranium-233/234	19 28 pCi/g		15-May-95
22393	GW02407GA	GW		Uranium-233/234	8 8591 pCi/l		16-May-95
14295	BH20837WC	BH	0 0 3 5	Uranium-235	1 535 pCi/g		15-May-95
1791	GW01753GA	GW		Uranium-235	0 8015 pCi/l		17-Nov-94
14295	BH20837WC	BH	0 0 3 5	Uranium-238	101 1 pCi/g		15-May-95
1791	GW0287IT	GW		Uranium-238	4 087 pCi/l		14-May-92

* Location Code - See Figure 1-1 for location of sample points

** Lab Qualifier

B - Detected concentration was less than contact required detection limits (CRDL) and above instrument detection limits (IDL), or activity exceeded minimal detectable activity

D - Organics analysis performed at a dilution

J - Positively identified below Sample Quantitation Limits (SQL) - result is estimated

TABLE 1.2-2 MAXIMUM CONCENTRATIONS OF CHEMICALS OF CONCERN DETECTS FOR GROUNDWATER AND SUBSURFACE SOILS NEAR IHSS108 (TRENCH T-1)

*LOCATION CODE	SAMPLE NUMBER	SAMPLE TYPE	DEPTH (Ft)	ANALYTE	RESULT	**LAB QUAL	SAMPLE DATE
4386	43-86-03-11-87	GW		Carbon Tetrachloride	6 µg/l		11-Mar-87
2387	23-87-02-07-89	GW		Chloroform	2 µg/l	J	7-Feb-89
1891	BH00126WCU2	BH	13 2 - 13 4	Methylene chloride	30 µg/kg	B	13-Nov-91
12091	GW02876IT	GW		Methylene chloride	16 µg/l	B	13-May-92
2387	23-87-05-03-89	GW		Tetrachloroethene	74 µg/l		3-May-89
4386	43-86-03-11-87	GW		Trichloroethene	8 µg/l		11-Mar-87
3587	BH358718BR	BH	18 4 - 19 5	Arsenic	14 mg/kg		28-Jul-87
12091	GW02876IT	GW		Arsenic	2 1 µg/l	BN	13-May-92
3587	BH358718BR	BH	18 4 - 19 5	Cadmium	3 3 mg/kg		28-Jul-87
2387	GW02032IT	GW		Cadmium	2 6 µg/l		23-Nov-91
2387	GW03256IT	GW		Mercury	0 33 µg/l		30-Jul-92
12091	GW02638GA	GW		Nitrate	5,190 µg/l		31-May-95
12091	GW02514IT	GW		Americium-241	1 09 pCi/l		27-Feb-92
3587	BH35870012	BH	0 0 - 12 3	Americium-241	0 4 pCi/g		27-Jul-87
12091	GW02116IT	GW		Plutonium-239/240	0 012 pCi/l		19-Dec 91
4386	GW01670IT	GW		Uranium-233/234	9 858 pCi/l		20-Aug-91
3587	BH358718BR	BH	18 4 - 19 5	Uranium-233/234	0 97 pCi/g		28-Jul-87
1891	GW01281GA	GW		Uranium-235	0 579 pCi/l		25-Aug-94
4386	GW01670IT	GW		Uranium-238	7 629 pCi/l		20-Aug-91
3587	BH358718BR	BH	18 4 - 19 5	Uranium-238	0 91 pCi/g		28-Jul 87

* Location Code - See Figure 1-1 for location of sample points
** Lab Qualifier
B - Detected concentration was less than CRDL and above IDL, or activity exceeded minimal detectable activity
J - Positively identified below SQL - result is estimated
N - Metals spike recoveries in the matrix spike sample did not meet advisory limits

TABLE 1.2-3 MAXIMUM CONCENTRATIONS OF CHEMICALS OF CONCERN DETECTS FOR GROUNDWATER AND SUBSURFACE SOILS NEAR IHSS112 (903 PAD)

*LOCATION CODE	SAMPLE NUMBER	SAMPLE TYPE	DEPTH (Ft)	ANALYTE	RESULT	**LAB QUAL	SAMPLE DATE
6691	GW03428IT	GW		1,1-Dichloroethene	150 µg/l	E	28-Aug-92
6591	BH01256WCU2	BH	21 1 - 21 3	1,1-Dichloroethene	3 µg/kg	J	3-Mar-92
6691	GW00384WC	GW		Carbon Tetrachloride	58,000 µg/l	E	19-Mar-93
6591	BH01256WCU2	BH	21 1 - 21 3	Carbon Tetrachloride	330 µg/kg	E	3-Mar-92
6691	GW00384WC	GW		Chloroform	64,000 µg/l	E	19-Mar-93
6591	BH01256WCU2	BH	21 1 - 21 3	Chloroform	240 µg/kg	E	3-Mar-92
6691	GW03848IT	GW		Methylene chloride	25,000 µg/l	E	17-Nov-92
6591	BH01264WCU2	BH	43 5 - 43 7	Methylene chloride	66 µg/kg	B	3-Mar-92
8891	GW01764GA	GW		Tetrachloroethene	20,000 µg/l		28-Nov-94
8891	BH00954WCU2	BH	22 4 - 22 6	Tetrachloroethene	110 µg/kg		3-Mar-92
8891	GW00385WC	GW		Trichloroethene	4,600 µg/l	E	12-Mar-93
8891	BH00954WCU2	BH	22 4 - 22 6	Trichloroethene	27 µg/kg		3-Mar-92
6691	GW03428IT	GW		Vinyl chloride	40 µg/l	E	28-Aug-92
8991	BH00752WCU2	BH	28 0 - 32 0	Arsenic	9 8 mg/kg	B	11-Mar-92
8891	GW03065IT	GW		Cadmium	21 7 µg/l		23-Jun-92
9091	GW02903IT	GW		Mercury	0 95 µg/l		20-May-92
8891	GW02647GA	GW		Nitrate	32,200 µg/l		19-Jun-95
9091	GW03432IT	GW		Americium-241	30 03 pCi/l		31 Aug-92
6691	BH00518WCU2	BH	2 0 - 8 0	Americium-241	7 2 pCi/g		25-Feb-92
9091	GW00388WC	GW		Plutonium-239/240	218 4 pCi/l		19-Mar-93
6691	BH00518WCU2	BH	2 0 - 8 0	Plutonium-239/240	68 0 pCi/g		25-Feb-92
8891	GW01247WC	GW		Uranium-233/234	18 7 pCi/l		10-Sep-93
6591	BH01268WCU2	BH	44 0 - 50 0	Uranium-233/234	1 4 pCi/g		4-Mar-92
8891	GW03849IT	GW		Uranium-235	1 pCi/l		17-Nov-92
6991	BH00706WCU2	BH	14 0 - 20 0	Uranium-235	0 118 pCi/g		26-Feb-92
8891	GW01247WC	GW		Uranium-238	38 6 pCi/l		10-Sep-93
8891	BH00550WCU2	BH	2 0 - 8 0	Uranium-238	2 1 pCi/g	B	3-Mar 92

* Location Code - See Figure 1-1 for location of sample points
** Lab Qualifier
B - Detected concentration was less than CRDL and above IDL, or activity exceeded minimal detectable activity
E - Exceeds calibration range of instrument, or value is estimated due to interference
J - Positively identified below SQL - result is estimated

Table 1 2-4 lists the proposed RFETS Action Levels for the VOC Chemicals of Concern within OU 2 These Action Levels will provide a basis for accelerated source removal actions within the Mound Site, Trench T-1, and the 903 Pad

TABLE 1 2-4 RFETS ACTION LEVELS [1]

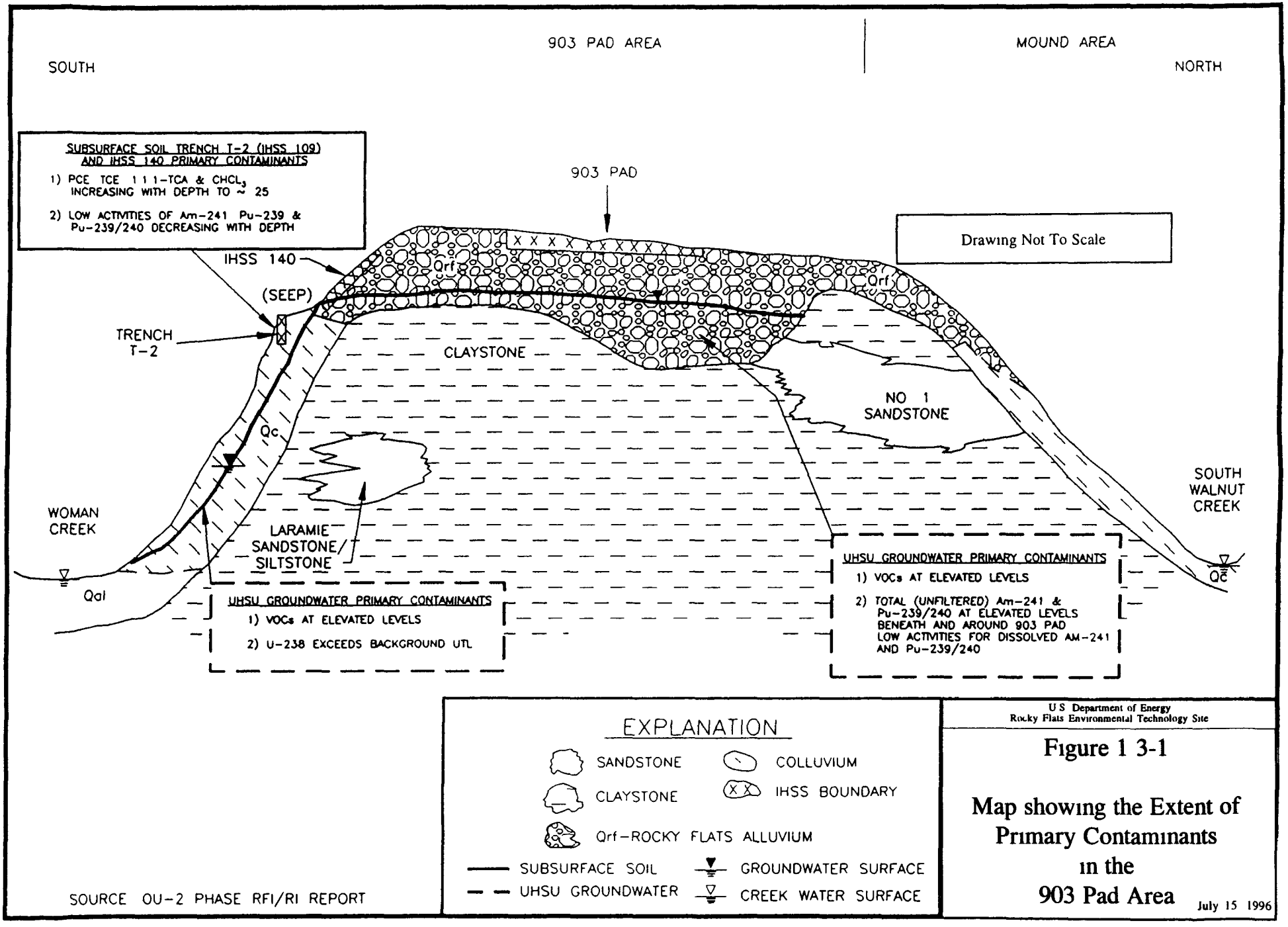
Chemical of Concern	Action Levels (mg/kg)
Trichloroethene (TCE)	9 27
Tetrachloroethene (PCE)	11 5
Carbon Tetrachloride (CCl4)	11 0
Total Petroleum Hydrocarbons (TPH), fuel constituents (benzene)	8 08

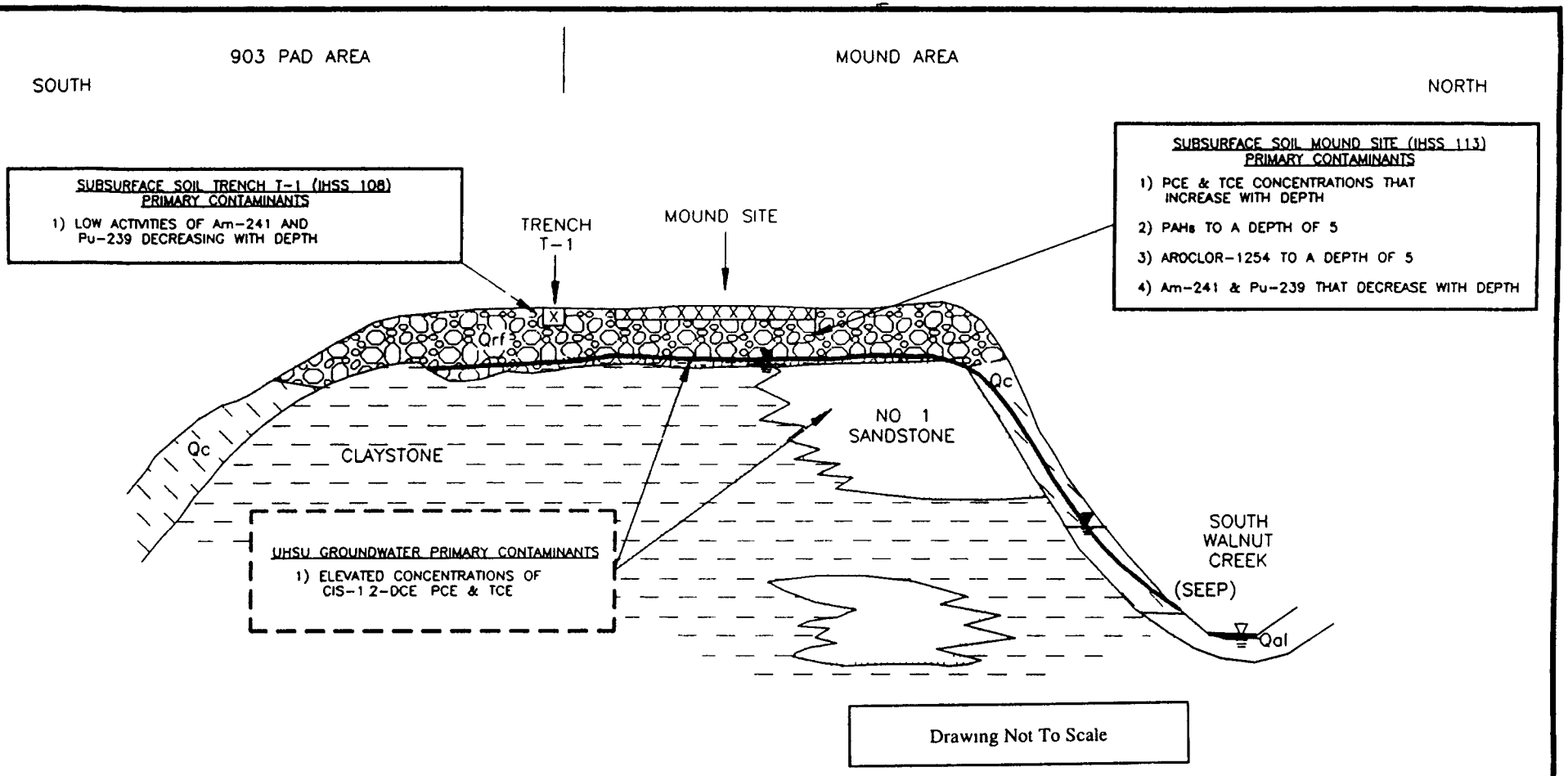
[1] Action Levels and Standards Framework for Subsurface Soils as established in Attachment 5 of the Draft Rocky Flats Cleanup Agreement (March 14, 1996)

1 3 Conceptual Site Model

The surficial geology in this area consists of Quaternary alluvium and colluvium, along with artificial fill, soil and debris deposits, and disturbed soil The surficial deposits overlie bedrock consisting of weathered claystone and minor bedrock sandstones of Cretaceous Arapahoe and Laramie Formations Surficial deposits consist of sandy clay and clayey gravel

The primary contaminant sources are located at the 903 Pad, Mound and East Trenches areas Potential release mechanisms from contaminated soil to the environment include storm water runoff, volatilization, wind suspension, infiltration and percolation to groundwater, direct contact, root uptake, and radioactive decay Transport media include groundwater, surface water, soil gas, and air These release and transport mechanisms and affected media are illustrated in the Conceptual Site Model (CSM) presented in Appendix B, Figure 10 1 Conceptual Site Model for Human Exposure Pathways Primary subsurface soil contaminants and Upper Hydrostratigraphic Unit (UHSU) groundwater contaminants for each IHSS are shown on Figures 1 3-1 and 1 3-2


SOUTH
903 PAD AREA
MOUND AREA
NORTH
SUBSURFACE SOIL TRENCH T-2 (IHSS 109) AND IHSS 140 PRIMARY CONTAMINANTS
1) PCE TCE 1 1 1-TCA & CHCL3 INCREASING WITH DEPTH TO ~ 25
2) LOW ACTIVITIES OF Am-241 Pu-239 & Pu-239/240 DECREASING WITH DEPTH
903 PAD
Drawing Not To Scale
IHSS 140
(SEEP)
TRENCH T-2
Qrf
CLAYSTONE
NO 1 SANDSTONE
Qc
WOMAN CREEK
LARAMIE SANDSTONE/ SILTSTONE
SOUTH WALNUT CREEK
Qal
UHSU GROUNDWATER PRIMARY CONTAMINANTS
1) VOCs AT ELEVATED LEVELS
2) U-238 EXCEEDS BACKGROUND UTL
UHSU GROUNDWATER PRIMARY CONTAMINANTS
1) VOCs AT ELEVATED LEVELS
2) TOTAL (UNFILTERED) Am-241 & Pu-239/240 AT ELEVATED LEVELS BENEATH AND AROUND 903 PAD LOW ACTIVITIES FOR DISSOLVED AM-241 AND Pu-239/240
EXPLANATION
SANDSTONE
COLLUVIUM
CLAYSTONE
IHSS BOUNDARY
Qrf-ROCKY FLATS ALLUVIUM
SUBSURFACE SOIL
GROUNDWATER SURFACE
UHSU GROUNDWATER
CREEK WATER SURFACE
SOURCE OU-2 PHASE RFI/RI REPORT
U S Department of Energy
Rocky Flats Environmental Technology Site
Figure 1 3-1
Map showing the Extent of Primary Contaminants in the 903 Pad Area
July 15 1996



EXPLANATION

- SANDSTONE
- COLLUVIUM
- CLAYSTONE
- IHSS BOUNDARY
- Qrf-ROCKY FLATS ALLUVIUM
- SUBSURFACE SOIL
- GROUNDWATER SURFACE
- UHSU GROUNDWATER
- CREEK WATER SURFACE

SOURCE OU-2 PHASE RFI/RI REPORT

U S Department of Energy
Rocky Flats Environmental Technology Site

Figure 1 3-2

Map showing the Extent of Primary Contaminants in the Mound Area

July 15 1996

2. SAMPLING AND DATA QUALITY OBJECTIVES

The primary objective of this SAP is to support the selection of remediation alternatives and accelerated source removal activities currently being planned for the Mound Site, Trench T-1, and the 903 Pad The data collected under this SAP will characterize contaminants contained within Trench T-1 as well as identify and delineate contaminated soil within the Mound Site, Trench T-1 and the 903 Pad Identifying and delineating the areal extent of the contamination will allow for a determination of the excavation areas and the volume of contaminated media to be treated, mitigating the impact to the environment and costs associated with the selected remediation alternatives

2.1 Data Quality Objectives

Data quality objectives (DQO) are set forth to optimize sample collection with respect to accomplishing the ultimate remediation objectives The DQO methodology will ensure collection of as few samples as possible (to minimize cost), while collecting enough samples to determine with a stated level of scientific confidence whether the project objectives have been accomplished The method is consistent with the latest EPA guidance (EPA, 1994, "EOA QA/G-4") For this project, the DQO is to acquire adequate data to characterize the contaminants within Trench T-1, and approximately define the three-dimensional extent of VOC contaminated soils exceeding the RFETS Action Levels for subsurface soils within the Mound and the 903 Pad, for the ultimate purpose of excavation and treatment

The tentative plan for excavation, removal and remediation of the contaminated soil is to use the sampling data results to identify and extend the remediation excavation past the contaminated sampling points into clean soil

Given the spacing strategy, of a 20 foot grid, there is a ninety-five percent confidence of detecting contamianted soils within a 23 foot diameter or an ellipse with 36 foot and 18 foot axis (Figure 10 3, Gilbert, 1987)

DQO	How Achieved
Acquire adequate analytical data to characterize the contaminants within Trench T-1	Collect subsurface soil samples from eight borehole locations within Trench T-1 Continually monitor and examine core for high VOCs, Rads, NAPL, and visible staining Collect samples at five and ten foot depths and if NAPL or visible staining is found, analyze for VOCs, SVOCs, Radionuclides, Metals, and TPH using Level III analytical methods
Define the areal extent of contaminated soils at the Mound Site to sufficiently support planning of remedial activities	Perform Soil Gas Surveys within and surrounding the Mound Site Continually monitor and examine core for high VOCs, Rads, NAPL, and visible staining Collect soil gas samples at five foot intervals Monitor soil gas for total VOCs using a GC Collect 2 soil samples (1 within an area of high VOCs or if NAPL or visible staining is found) for laboratory analysis to confirm field observations
Define the areal extent of contaminated soils at the 903 Pad to sufficiently support planning of remedial activities	Perform Soil Gas Surveys within and surrounding the 903 Pad Continually monitor and examine core for high VOCs, Rads, NAPL, and visible staining Collect soil gas samples at five foot intervals Monitor soil gas for total VOCs using a GC Collect 10 % of samples within areas of high VOCs or if NAPL or visible staining is found for laboratory analysis to confirm field observations

96-DMR-ERM-2041

2.2 Historical Data Summary

Subsurface soil samples and soil gas samples have been collected at the Mound Site during earlier investigations The existing data confirms the presence of VOC and radionuclide concentrations within the IHSS which are above cleanup levels However, available data is not adequate for determining the lateral or vertical extent of contamination above the cleanup levels Additional data is necessary to determine the volume of contaminated material to be excavated and treated

Previous investigations in Trench T-1 avoided the interior of the trench Therefore the available data is not suitable for characterizing suspected VOC and radiological contaminants The current data confirms that there are low levels of contamination in the vicinity of Trench T-1 However, since there are no samples from within this trench, it is not clear if this contamination is due to Trench T-1, or is related to other nearby IHSSs Samples from within the trench are necessary to determine the radiological and VOC contaminants present This information is crucial in determining the final disposition of the trench and selecting a remediation method

Previous investigations and existing groundwater wells in the 903 Pad area confirm the presence of a VOC plume emanating from this area General knowledge of the releases and types of contaminants is available, but specific data necessary to determine the concentrations and extent of VOC contamination beneath the asphalt cap and soil is not available Previous investigations were broad in scope and were not focused on locating subsurface source areas, or provide sufficient information to develop an accurate volume estimate of contaminated soil

2.3 Data Analytical Levels

The level of analytical data appropriate for this investigation is as follows

- Laboratory analysis of VOCs in subsurface samples will be performed in accordance with Level III analytical procedures and reporting requirements
- Laboratory analysis of NAPLs, if performed, will be in accordance with Level III analytical procedures and reporting requirements
- Laboratory analysis of soil gas samples will be conducted using gas chromatography (GC) methods in accordance with Level II analytical requirements
- Analytical results will be compared with field screening results as a check for field instrument accuracy

3. SAMPLE COLLECTION AND ANALYSES

In order to ensure adequate data is collected to characterize Trench T-1 and derive the necessary volume estimates of contaminated soil at the Mound Site, Trench T-1 and the 903 Pad a combination of soil gas and subsurface soil samples will be collected

3 1 Sampling and Analyses

All boreholes will be drilled with a hydraulic push drill rig one to two feet into bedrock or to a sufficient depth to confirm weathered bedrock Depths are estimated to be between fifteen and twenty feet below ground surface The exception to this will be boreholes located within Trench T-1 Boreholes within the trench will extend only to the trench bottom which is estimated to be between nine and ten feet below ground surface This will mitigate the possibility of creating new or additional pathways for contaminant migration from the trench to groundwater

Core samples will be collected continuously in five foot intervals from the surface to approximately two feet into bedrock or the bottom of the trench Five foot long core runs will be pushed using a hydraulic sampling tool (Geoprobe) Sampling intervals are detailed in sections 3 2 1, 3 2 2 and 3 2 3 Core samples will first be subjected to radiological field screening, then inspected visually under natural light for signs of NAPLs or staining, visually logged by the field geologist, and finally screened for VOCs as detailed below

Subsurface soil samples will be collected for laboratory analysis to characterize contaminants within Trench T-1 and to verify results of soil gas analyses Soil samples will be handled in accordance with Rocky Flats SOPs

- FO 10, Receiving, Labeling, and Handling Environmental Material Containers, and

- FO 13, Containerization, Preserving, Handling, and Shipping of Soil and Water Samples Depths of sampling may be altered if the field screening or visual inspection indicates the presence of contamination at depths other than those specified in sections 3 2 1, 3 2 2 and 3 2 3

All laboratory work will be done according to the US Environmental Protection Agency's (USEPA's) Contract Lab Program (CLP) standards The CLP-type analysis is outlined in the document entitled "EG&G Rocky Flats, General Radiochemistry and Routine Analytical Service Protocol (GRRASP) version 3 0, 1994 "

Field conditions expected during the investigation

- Background levels of radionuclides are expected to be encountered, during most operations but soil cores will be field screened upon retrieval At the 903 Pad higher levels are expected and no activities will be conducted prior to a full radiological screening of the soil gas monitoring locations. Continuous radiological monitoring will occur during intrusive activities

- Field work will be performed primarily in modified-Level D Personal Protective Equipment (PPE), except where otherwise indicated by the HASP
- Soil core sampling will be performed in compliance with the Health and Safety Plan if high VOC readings occur during monitoring

3.2 Soil Boring Locations

3.2.1 Trench T-1

Eight geoprobe soil borings will be located within Trench T-1 near areas believed to contain buried drums located during electromagnetic surveys These areas were identified during the 1995 Trenches Area and Mound Site Characterization activities by electromagnetic surveys Boreholes will be located close to the areas believed to contain drums, but far enough away to avoid inadvertently puncturing any drums Prior to intrusive activities, the proposed areas will be cleared using magnetometer surveys Figure 3 2 1-1 shows the location of Trench T-1 and the proposed borehole locations based upon the results of the electromagnetic survey These locations may be modified pending the results of magnetometer surveys prior to drilling Depth of borings will not exceed 10 feet in Trench T-1 to avoid penetrating the bottom of the trench and creating a potential pathway for contaminant migration Soil samples will be collected at depths of five and ten feet intervals below ground surface (BGS) unless examination of the core indicates staining or the presence of NAPL is detected In these instances, samples will be collected from the appropriate segments of the core sample

3.2.2 Mound Site

Geoprobe borings for soil gas and subsurface soils at the Mound will be located in the area of previously detected high soil gas readings, per the diagram in Figure 3 2 2-1 These locations are based upon previous sampling activities and will concentrate around the area of borehole 14295 which exhibited the highest levels of VOCs found at the Mound Site Soil gas sample locations will be located twenty feet to the north, south, east and west of location BH14295 Samples will be collected at five feet intervals BGS to a depth of one or two feet below bedrock If total VOCs are detected above ten ppm, then the sampling grid will be extended an additional twenty feet to the north, south, east, and west of that location and additional samples will be taken

If NAPL is encountered, the step out will be reduced to 10 feet This process will continue until the area of contamination above 10 PPM is defined Soil samples (approximately 10%) will be collected from the areas of the highest Total VOC concentrations as confirmation samples Geoprobe locations will be modified in

96-DNR EPM-0041

the field on the basis of the field results as obtained (i e if areas of high VOC contamination are found, additional locations for soil gas sampling may be required to further delineate the extent of contamination)

3.2.3 903 Pad

Geoprobe soil gas and subsurface soil sampling at the 903 Pad will be implemented near wells 08891, 06691, and 09091 using the same sampling grid as the Mound Site Geoprobe holes will be located 20 feet apart per Figure 3 2 3-1 Soil gas sample locations will be spotted twenty feet to the north, south, east and west of locations 08891, 06691, and 09091 Samples will be collected at five feet intervals BGS to a depth of one or two feet below bedrock If total VOCs are detected above ten ppm, then the sampling grid will be extended an additional twenty feet to the north, south, east, and west of that location and additional samples will be taken

If NAPL is encountered, the step out will be reduced to 10 feet This process will continue until the area of contamination above 10 PPM is defined Soil samples (approximately 10%) will be collected from the areas of the highest Total VOC concentrations as confirmation samples Geoprobe locations will be modified in the field on the basis of the field results as obtained (i e if areas of high VOC contamination are found, additional locations for soil gas sampling may be required to further delineate the extent of contamination)

Table 3 2-1 presents a summary of the investigative methods to be used at each site

TABLE 3.2-1 INVESTIGATIVE METHODOLOGY BY LOCATION

Location	Method
Trench T-1 IHSS 108	Geoprobe soil core sampling (8 subsurface soil sampling locations with samples collected at 5 and ten foot intervals BGS), and geophysical (magnetometer) survey to clear the area prior to any intrusive activities to ensure buried drums will not be punctured during soil sampling activities
Mound Site IHSS 113	Geoprobe soil core sampling (2 locations with samples collected at five foot intervals BGS based upon field observations and detected areas of high total VOC concentrations), and soil gas sampling (approximately 15 sampling locations with samples collected at five foot intervals BGS to bedrock) along a twenty foot sampling grid based around location BH14295
903 Pad IHSS 112	Soil gas (approximately 30 sampling locations with samples collected at five foot intervals BGS to bedrock) along a twenty foot sampling grid based around locations 08891, 06691 and 09091, and soil core [1] sampling (four minimum locations with samples collected at five foot intervals BGS based upon field observations and detected areas of high total VOC concentrations)

[1]Approximately three samples per borehole, dependent on soil gas results with a minimum of four locations at the discretion of the field geologist

This SAP will be conducted under the Environmental Restoration (ER) Sitewide Quality Assurance Project Plan (QAPjP) Table 3 2-2 summarizes the analytical protocols for subsurface soils and soil gas analyses Table 3 2-3 summarizes the analytical protocols to be used for liquids

TABLE 3.2-2 ANALYTICAL PROTOCOLS FOR SOILS AND SOIL GAS

Soils and Soil Gas Analysis				
Analysis Method	***No. of Samples**	**QC Samples**	**Total Samples**	**Container/ Preservatives/ Holding Time**
Soils				
Volatile Organics/TCL-VOA Modified Method 8210	60	1 duplicate per 20	63	4 oz glass w/Teflon liner/4°C/ 7 days
		1 field blank	1	4 oz glass w/ Teflon liner/4°C/ 7 days
Radionuclides/ Am241, Pu239/240, U, Alpha Spec	64	1 duplicate per 20	67	500 ml glass jars/NA/61 days
		1 field blank	1	500 ml glass jars/NA/61 days
Soil Gas Analysis				
GC [1]	90	9 duplicates	99	500 ml glass jars /NA/14

* The number of samples collected will be determined by field observations and by results from field instrumentation

[1] The same methodology that was used for volatile screening on the remediation of Trench T 3/4 will be used in this investigation The procedures from which this method was derived are described in detail in SW-846 Methods 8240 and 8260, and the CLP SOW Due to the rapid time constraints for screening samples, laboratory control samples and full CLP data packages are not required for this project Data Quality Objectives allow samples to be analyzed at levels comparable to the action levels required for this project Low detection limits are not required for this project, and would prohibit the rapid analysis required to carry out the program

TABLE 3.2-3 ANALYTICAL PROTOCOLS FOR LIQUIDS

Liquids Analysis				
Analyte Method	***Samples**	**QC Samples**	**Total Samples**	**Containers/ Preservative/ Holding Time**
Groundwater	(if present)			
Volatile Organics/TCL-VOA Modified Method 8210	3	1 duplicate	4	2-40 ml VOA vials/ 4°C/7 days
		1 rinsate	1	2-40 ml VOA vials/ 4°C/7 days
		1 trip blank per cooler		2-40 ml VOA vials/ 4°C/7 days (containers filled by laboratory)
Pu239/240 Am241 U Alpha Spec	3	1 duplicate	4	1 gal poly//HNO_3/61 days
		1 rinsate		1 gal poly/HNO_3/61 days
NAPL	(if present)			
Volatile Organics/TCL-VOA Modified Method 8210	3	1 duplicate	4	2-40 ml VOA vials/ /4°C/7 days
		1 rinsate		4 oz glass w/ Teflon liner/4°C/7 days
Pu239/240 Am241 U Alpha Spec	3	1 duplicate	4	1 gal poly/HNO_3/61 days

* The number of samples collected will be determined by field observations made by the geologist and by results from field instrumentation

3.3 Soil Boring Surveying and Abandonment

The borings will be marked with unique numbered flags immediately after completion The numbering on the flags will be correlated with the sample analyses Boring locations will be surveyed using the Global Positioning System (GPS) which provides digital information that will be placed into the Rocky Flats Environmental Database System (RFEDS) The digital information will be used to produce computer generated maps of the soil boring locations The GPS survey will be conducted in accordance with the manuals provided by the manufacturer of the surveying equipment, Ashtech, Inc

The borings will be abandoned in accordance with procedure Plugging and Abandonment of Boreholes (5-21000-ER-OPS-GT 05) and modified as follows The borehole will be backfilled with powdered or granular bentonite from ground surface

4 SAMPLE DESIGNATION

The location and depth interval of all subsurface materials, either solid or liquid recovered from the Mound Site, Trench T-1, or the 903 Pad during the course of this investigation will be recorded in the field log book RFEDS location codes will be cross indexed to appropriate sample grid location designations in the field log book Soil core and other material that is subject to only field screening will be identified by the sample location code and grid coordinates and depth interval where the sample is obtained Samples undergoing VOC or radioisotope analysis will have RFEDS sample numbers applied to the container labels in the field The numbers will be applied sequentially as the samples are collected and the chain-of-custody (COC) form is prepared A block of sample numbers for soil gas samples and borehole samples as well as a block of location codes will be obtained from the RFEDS A block of location codes and sample numbers will be of sufficient size to include the entire number of possible locations and samples scheduled for analysis and an additional twenty percent for potential additional locations and samples

Soil gas sample numbers will be assigned the prefix "SG" followed by a four digit number and a contractor indicator Borehole samples will be assigned the prefix "BH" followed by a four digit number and a contractor indicator All samples numbers will be assigned sequentially

5. SAMPLING EQUIPMENT AND PROCEDURES

Sampling will be conducted through the use of the Geoprobe, equipped for core recovery and liquid sampling The core recovery equipment will be operated in

accordance with procedures presented in GT 02, subsection 5 3 5 and as modified by GT 39, Push Subsurface Soil Sample If free product is encountered in any of the boreholes, an attempt will be made to collect a liquid sample and submit it for analysis

Tables 5-1 and 5-2 list the applicable procedures for this SAP

TABLE 5-1 FIELD AND ADMINISTRATIVE STANDARD OPERATING PROCEDURES

IDENTIFICATION NUMBER:	PROCEDURE TITLE:
5-21000-OPS-FO 3	General Equipment Decontamination
5-21000-OPS-FO 6	Handling of Personal Protective Equipment
5-21000-OPS-FO 7	Handling of Decontaminated Water and Waste Water
5-21000-OPS-FO 10	Receiving, Labeling, and Handling Environmental Materials Containers
5-21000-OPS-FO 11	Field Communications
5-21000-OPS-FO 12	Decontamination Facility Operations
5-21000-OPS-FO 13	Containerization, Preserving, Handling, and Shipping of Soil and Water Samples
5-21000-OPS-FO 14	Field Data Management
5-21000-OPS-FO 15	Photoionization Detectors and Flame Ionization Detectors
5-21000-OPS-FO 16	Field Radiological Measurements
5-21000-OPS-FO 18	Environmental Sample Radioactivity Content Screening
4-B11-ER-OPS-FO 25	Shipping Limited Quantities of Radioactive Materials in Samples
5-21000-ER-OPS-GT 01	Logging Alluvial and Bedrock Material
5-21000-ER-OPS-GT 02	Drilling and Sampling Using Hollow Stem Auger Techniques
5-21000-ER-OPS-GT 05	Plugging and Abandonment Boreholes
5-21000-ER-OPS-GT 09	Soil Gas Sampling and Field Analysis
4-S64-ER-OPS-GT 39	Push Subsurface Soil Sample
5-21000-ER-OPS-GW 06	Groundwater Sampling
1-50000-ADM-12 01	Control of Measuring and Test Equipment

TABLE 5-2 LABORATORY STANDARD OPERATING PROCEDURES

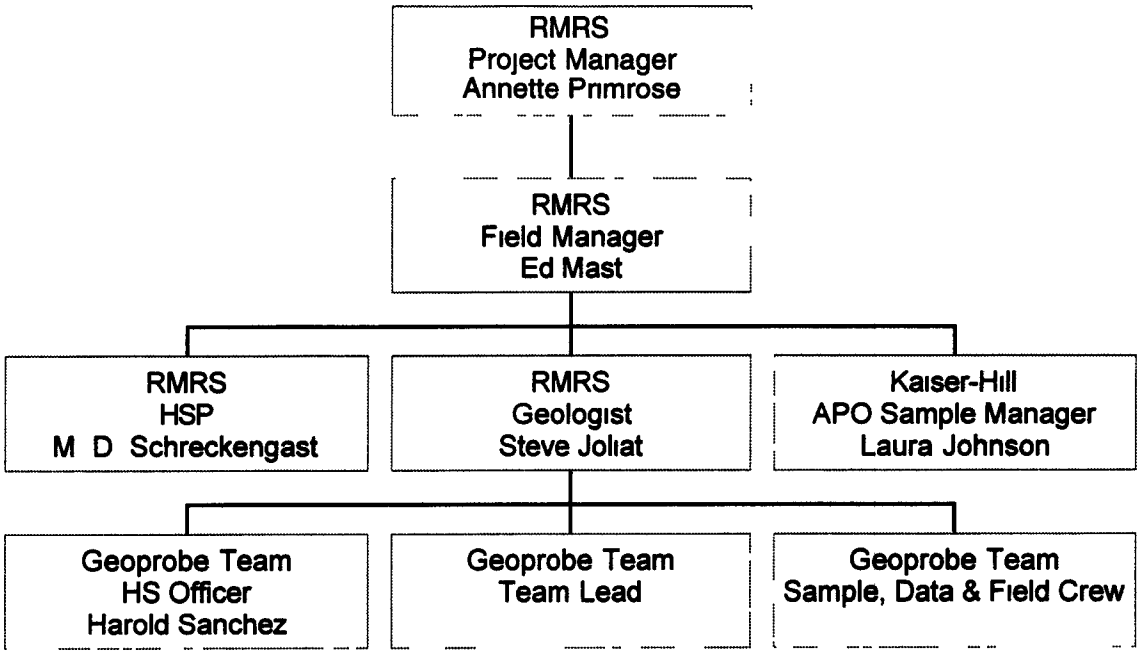
ANALYTICAL SUITE:	CONTROLLING DOCUMENTS:
VOCs	Title 40 of the Codes of Federal Regulation Part 264 Appendix IX Methods 8210 (modified) and others applicable to TCL-VOA in soils All laboratory analyses will also adhere to protocols specified in Parts A and B of the RFETS General Radiochemistry and Routine Analytical Services Protocol (GRRASP)
Radionuclides	Part B of the GRRASP

A field notebook will be created and maintained for the project by the Project Manager or their designee This will be used in conjunction with the appropriate field data forms required by the operating procedures (Table 5-1) governing the field activities occurring during this project It is not necessary to duplicate items recorded on field data forms in the field notebook, but if additional clarification of entries on the forms is required, they should be recorded in the field notebook The field notebook should include time and date information concerning the field activities and a sketch map of actual sample locations with a cross index of sample location IDs, RFEDS and other sample numbers, and COC numbers Information not specifically required by the field data forms should be recorded in the field notebook Soil cores will be logged in accordance with GT 01, "Logging Alluvial and Bedrock Material" with sufficient detail in the field that detailed logging will not be performed Soil core observations will be recorded on Form GT 1A, Rocky Flats Plant Borehole Log and not on Form GT 1B, Preliminary Well-Site Field Log Soil core will be screened for VOCs and radioactive contaminants, a portion or portions from different intervals of the same core run will be used for ambient temperature headspace (ATH) readings per GT 09, and the remaining sections of core will be placed into Ziploc bags before placement in a core box for future reference Samples for ATH will be labeled with location code and depth interval Soil samples will not have to be photographed

6. PROJECT ORGANIZATION

For the purpose of this investigation the work breakdown structure shown in Figure 6-1 shall be implemented

FIGURE 6-1 - PROJECT ORGANIZATION CHART



7. DATA MANAGEMENT and QUALITY CONTROL

Data shall be acquired, manually or automatically, as specified in this SAP, data forms provided in the standard operating procedure F0 14, "Data Management" may be used for this purpose

The minimum parameters that must be documented include

The originator shall authenticate (legibly sign and date) each resulting, completed hardcopy of the data acquired above

A peer reviewer, someone other than the originator, shall perform a peer review on each hardcopy of data

The Peer Reviewer shall authenticate (legibly sign and date) each resulting hardcopy completed by the originator Any modifications shall be lined through, initialed, and dated by the reviewer (in ink)

Data planned for computerized reduction and analysis shall be uploaded on a personal computer using commercially available software Hardware and software specifications shall be documented in the project files and communicated in the final report

Following data entry (uploading), a hardcopy of the uploaded data shall be printed and compared with the original quality record Any modifications shall be lined through, initialed, and dated by the reviewer, and subsequently corrected on the computer Ensure that hardcopies also display the following information (typically) as titles, subtitles, headers, or footers, etc) in addition to all data contained within the digital file eneric title describing the data, filename, and, date

File the corrected hardcopies of uploaded data as Quality Records in the project files

Digital data shall be backed-up weekly and filed in a structurally separate location (than the master files)

Within two weeks of final data acquisition or six months of project completion, whichever is sooner, submit originals and one copy of all quality records (i e , hardcopies and digital files) to the RMRS Records Center (note digital files must be labeled with indelible ink, and communicate at least the following information file name(s), hardware, and software platforms)

8. REFERENCES

DOE 1991, *Final Phase II RFI/RI Work Plan TM 1, RFP 903 Pad, Mound and East Trenches Areas*

DOE 1992, *Final Historical Release Report for the Rocky Flats Plant*

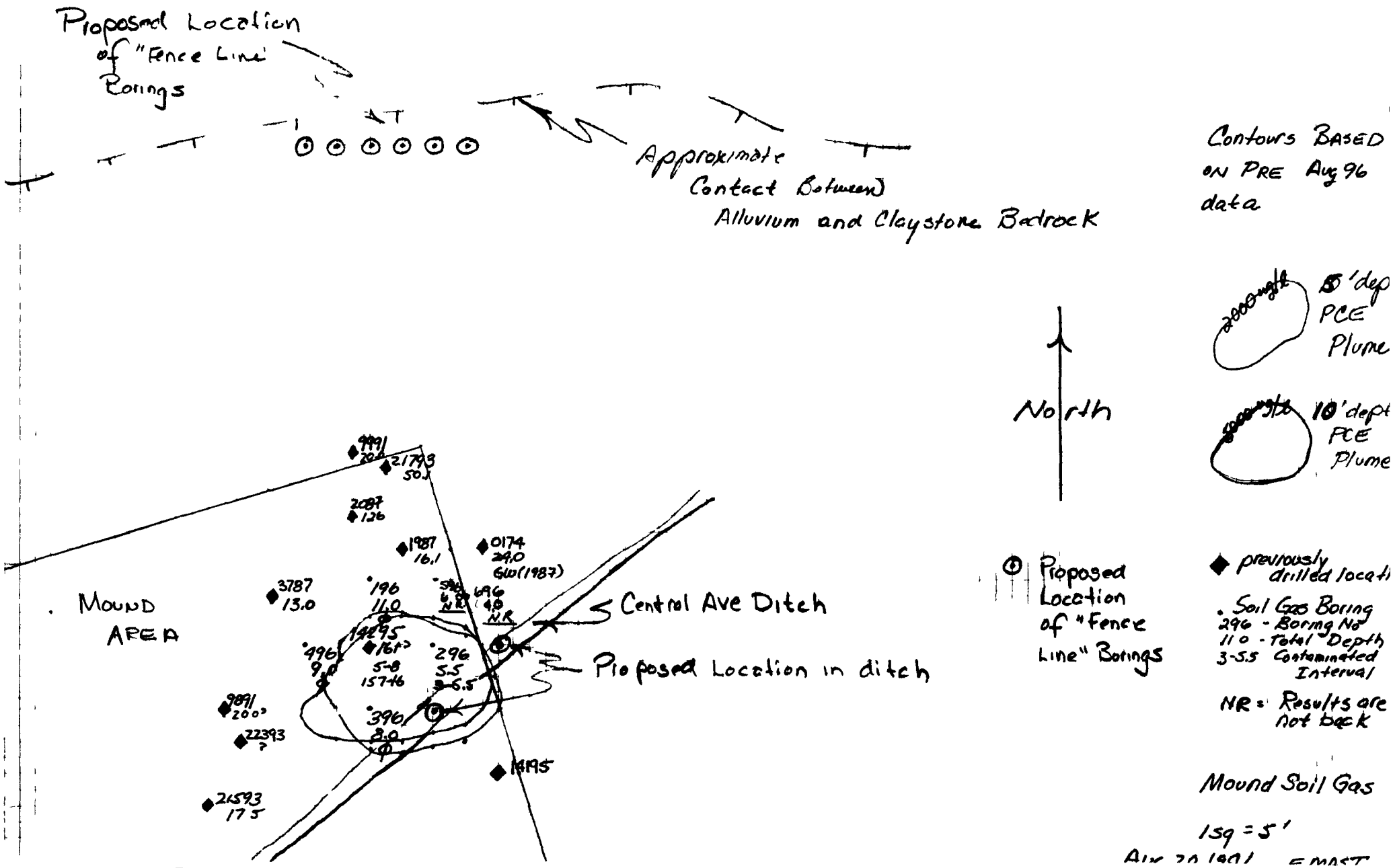
DOE 1994, Technical Memorandum No 9 Chemicals of Concern, Human Health Risk Assessment 903 Pad, Mound, and East Trenches Areas Operable Unit No 2, August 1994

DOE 1995, *Phase II RFI/RI Report for Operable Unit No 2 903 Pad, Mound, and East Trenches Area,* RF/ER-95-0079 UN

EPA, 1994, "EOA QA/G-4, *Guidance for Planning for Data Collection in Support of Environmental Decision Making Using the Data Quality Objectives Process"*

Action Levels and Standards Framework for Surface Water Soils, Ground Water, and Attachment 5 of the Draft Rocky Flats Cleanup Agreement (March 14, 1996)

Gilbert, R O , 1987, Statistical Methods for Environmental Pollution Monitoring, Van Nostrand Reinhold


Proposed Location of "Fence Line" Borings
Approximate Contact Between Alluvium and Claystone Bedrock
Contours BASED ON PRE Aug 96 data
5'dep PCE Plume
10'dept PCE Plume
North
Proposed Location of "Fence Line" Borings
previously drilled locati
Soil Gas Boring
296 - Boring No
110 - Total Depth
3-5.5 Contaminated Interval
NR = Results are not back
MOUND AREA
Central Ave Ditch
Proposed Location in ditch
9991 20.4
21793 50.1
2087 12.6
1987 16.1
0174 24.0 GW(1987)
3787 13.0
196 11.0
696 4.0 NR
296 5.5-6.5
396 8.0
9891 20.0
22393
16195
21593 17.5
Mound Soil Gas
1sq = 5'
Aug 20 1997 EMAST

Document Modification Request for the Sampling and Analysis Plan for the Pre-Remediation Investigation of the Mound, 903 Pad and Trench T-1 RF/ER-96-0041 Un, Rev 0

1 0 INTRODUCTION

Add to the Introduction in the first sentence (words in *italics*)

and define the areal extent of the volatile organic compound (VOC) contamination at the Mound Site (IHSS 113) ***and in part establish that the Mound Site is the source of contamination of SW59***

Section 3 2 Soil Boring Locations

3 2 1 Mound Site

Add the following paragraphs to the bottom of this section

The intent of the soil borings in the Mound Area was to penetrate through the alluvium into unweathered bedrock which was projected to be 15 to 20 feet BGS. However, adverse field conditions, tight clays and large cobbles, have prohibited the collection of soil samples at depths greater that 11 feet in the first nine borings completed. Because of the inability to completely penetrate the alluvium with the geoprobe, the potential pathway for contamination can not be fully established. To further establish this pathway, a series of boring downgradient from the Mound Area and between the Mound Area and contaminated well at SW59 will be completed. All but two of the remaining proposed boring locations will be reprogrammed. The two exceptions are the borings that are located in the Central Avenue Ditch. These two boring will be completed when the ditch dries out.

The remaining borings will be located in a "fence line" north of the Mound Area within 20 feet and south of the subcrop of the alluvial/bedrock contact. The alluvial/bedrock subcrop contact can be identified in the field by a observable change in slope between the more resistant alluvium versus the less resistant claystones of the bedrock.

The borings will be spaced approximately 10 feet apart and the initial location will be north of BH14295 with the exact location at the discretion of the project geologist. The depth of these borings is expected to be 10 to 15 feet but will, when possible, be completed into unweathered bedrock (see attached sketch map).

The sampling intervals and analytical suite will be the same as the initial program.

Add to the DQO Table on page 15 of the FSP

Data Quality Objectives

DQO	How Achieved
Determine if the pathway of contaminate flow coming off the Mound Area is to the north from BH14295 and if it is, define the east to west component of contaminate flow.	**Using the geoprobe, collect soil samples for a GC analysis of the soil gas in the head space of the collected sample. If groundwater is present in the borings, samples will be collected. The analytical suite will be consistent with Table 3.2-2 Analytical Protocols for Soils and Soil Gas.** **Collect continuous core soil samples at five foot intervals. If staining or detects from the FID or PID are observed, that interval will be collected. Otherwise collect the sample at the end of the five foot run.**

E 2 085 950 E 2 086 000 E 2 086 050 E 2 086 100 E 2 086 150 E 2 086 175

N 749 530 N 749 500 N 749 450 N 749 400 N 749 350

N 749 530 N 749 500 N 749 450 N 749 400 N 749 350

01791

BH3687

IHSS 166 Boundary

Trench T 1

12091

01891

BH14595

BH3587

E 2,085,950 E 2,086,000 E 2,086,050 E 2,086,100 E 2,086,150 E 2,086,175

T 1 Proposed Sampling Locations

Electromagne Contour Map EM 61 Data
Chann 1 2 Response

- Borehole
- Groundwater Well
- Cha acterization Borehole
- Proposed Sample Locations
- Channel 2 Response Isopleth Contour Interval = 500 mv
- IHSS Boundary
- Trench Boundary

DATA SOURCE:
Base maps, roads, and fences provided by
Aeroflex Corp.,
EG&G Rocky Flats, Inc. 199
Hydrology provided by
USGS (date unknown)
Electromagnetic data provided by Woodward-
Clyde Apex, 1995.
Characterization Boreholes provided
by Woodward Clyde May 1995.

Scale 220
Inch represents approximately 0.33 feet

5 0 10ft

State Plane Coordinate Projection
Colorado Central Zone
Datums: NAD27

U S Department of Energy
Rocky Flats Environmental Technology Site

Figure 3 2 1 1

Proposed Sampling Locations
Within T 1

July 15 1996

Mound Proposed Sampling Locations

EXPLANATION

- Characterization Boreholes
- Boreholes
- Groundwater Wells
- Paved Roads
- Unpaved Roads
- Streams, Ditches, or other Drainage Features
- Contours (10 Intervals)
- Trench Boundaries
- Buildings and other Structures
- Individual Hazardous Substance Sites (IHSS)
- 10 Grid

o Geoprobe/Soil Gas Sampling Location

A total of 17 geoprobe locations will be completed 4 locations (as shown on map) have been programmed for 20 ft north east south and west of BH14295 the locations of the remaining geoprobe borings will be determined by the soil gas results

Scale 400 inch represents approximately 33.33 feet

15 0 30f

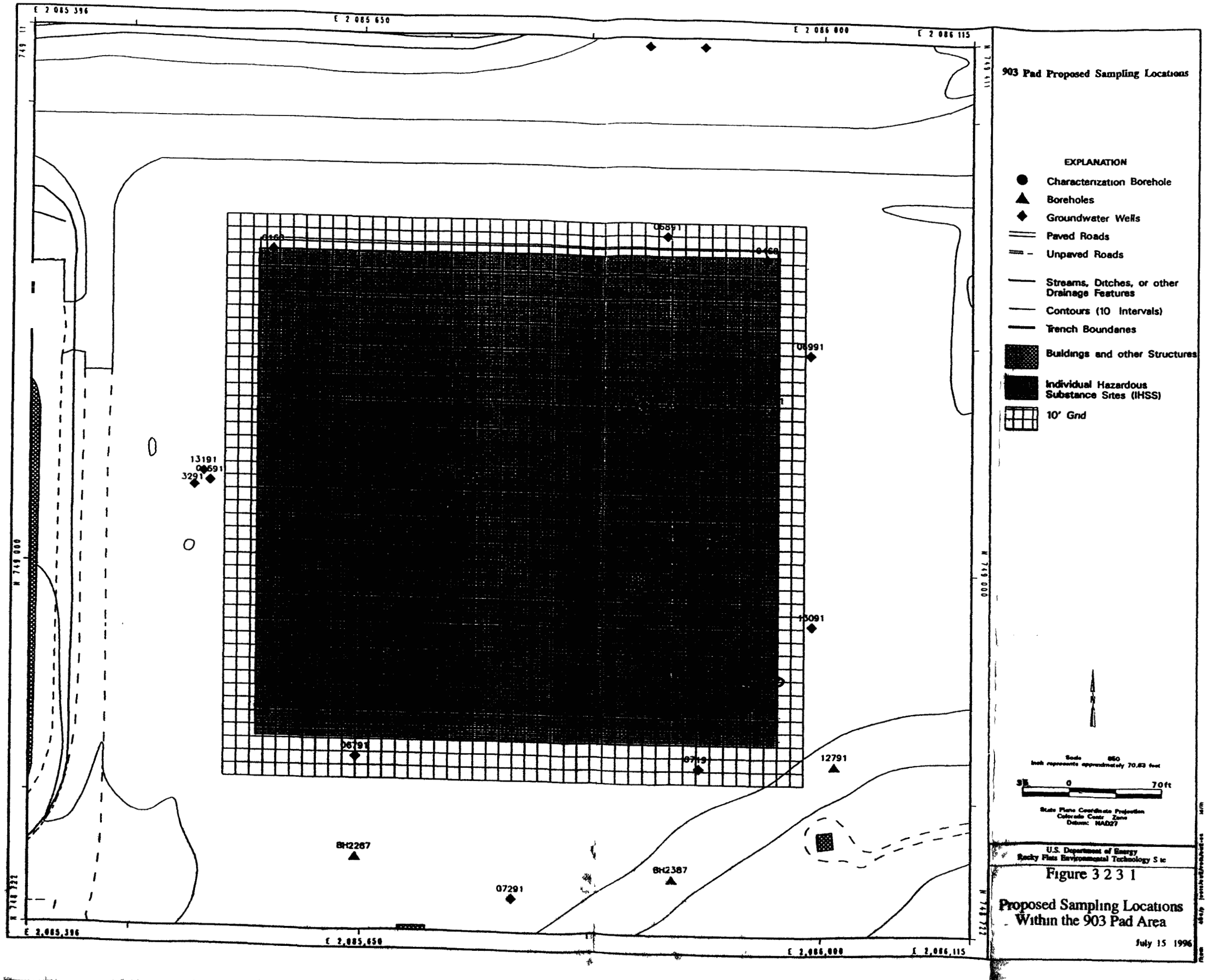
State Plane Coordinate Projection Colorado Central Zone Datum NAD27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

Figure 3 2.2 1

Proposed Sampling Locations Within the Mound Site

July 15, 1996


E 2 085 396
E 2 085 650
E 2 086 000
E 2 086 115
N 749 111
N 748 922
E 2,085,396
E 2,085,650
E 2,086,000
E 2,086,115
903 Pad Proposed Sampling Locations
EXPLANATION
Characterization Borehole
Boreholes
Groundwater Wells
Paved Roads
Unpaved Roads
Streams, Ditches, or other Drainage Features
Contours (10 Intervals)
Trench Boundaries
Buildings and other Structures
Individual Hazardous Substance Sites (IHSS)
10' Grid
13191
05691
3291
05891
05991
15091
06791
07191
12791
BH2287
BH2387
07291
Scale 850
Inch represents approximately 70.83 feet
35 0 70ft
State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27
U.S. Department of Energy
Rocky Flats Environmental Technology Site
Figure 3 2 3 1
Proposed Sampling Locations
Within the 903 Pad Area
July 15 1996